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E. Required Information

1. ~~Is document potentially Classified?~~ ◉ No ○ Yes (MANDATORY)

K. C. Brunke
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Information Clearance Approval

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K. If Additional Comments, Please Attach Separate Sheet

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Proposed Plan for Remediation of the 221-U Facility (Canyon Disposition Initiative)

Prepared for the U.S. Department of Energy
Assistant Secretary for Environmental Management

United States Department of Energy
P.O. Box 550
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DOE/RL-2001-29
Revision 0

Proposed Plan for Remediation of the 221-U Facility (Canyon Disposition Initiative)

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Prepared for the U.S. Department of Energy
Assistant Secretary for Environmental Management

United States Department of Energy
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Release Approval Date

PROPOSED PLAN FOR REMEDIATION OF THE 221–U FACILITY (CANYON DISPOSITION INITIATIVE)

Hanford Site, Richland, Washington

INTRODUCTION

Environmental cleanup (**remedial action**)[1] is needed at the U Plant Area, which lies within the 200 West Area of the Hanford Site (Figures 1 and 2). Cleanup is needed to reduce risks to human health and the environment posed by contaminated waste. The U Plant Area project involves numerous facilities, structures, and sites, and to address the remediation of contamination associated with these different locations, the cleanup has been divided into five components:

- The 221–U Facility[2],
- Facilities that are ancillary or related to the 221-U Facility,
- Underground pipelines,
- Soil waste sites, and
- Groundwater underlying the area.

Remedial action for the U Plant Area is required by the ***Comprehensive Environmental Response, Compensation and Liability Act of 1980*** **(CERCLA).** The U.S. Department of Energy (DOE) has incorporated the ***National Environmental Policy Act of 1969*** **(NEPA)** values into the CERCLA process evaluation of the remedial action and a summary of the results is presented in this document.

EPA, ECOLOGY, AND DOE ANNOUNCE PROPOSED PLAN

This **Proposed Plan** identifies the preferred alternative for remedial action at the 221–U Facility. In addition, the plan includes summaries of other alternatives analyzed. Historically, the 221–U Facility was used to recover uranium and to decontaminate and reclaim radiologically contaminated equipment. Because of these activities, **hazardous substances** remain within the 221–U Facility that present a potential threat to human health and the environment. The preferred alternative for remediation of these hazardous substances at the 221–U Facility is to partially demolish the structure, fill void spaces with grout, and dispose in place hazardous substances and the resulting demolition debris inside and adjacent to the remaining structure under an **engineered barrier**.

[1] Technical terms in bold are defined in the glossary at the end of this document.

[2] The term "221–U Facility" includes the 221–U Building, the 271–U Support Services Building, and the 276–U Solvent Handling Facility.

MARK YOUR CALENDAR

Public Comment Period: This Proposed Plan is being issued by the Tri–Parties for public comment. Tribal nations, stakeholders and the general public are encouraged to comment during the public comment period that will run from December 13, 2004 to January 31, 2005. A remedy will be selected only after the public comment period has ended and comments received have been reviewed and considered. Responses to significant comments will be presented in a Responsiveness Summary that will be part of the Record of Decision.

Written comments on the Proposed Plan will be accepted through January 31, 2005. Comments should be sent to:

Craig Cameron
U.S. Environmental Protection Agency
712 Swift Boulevard, Suite 5
Richland, Washington 99354
cameron.craig@epa.gov
FAX (509)376-2396

To receive a copy of the Proposed Plan contact the Hanford Cleanup Line: 1-800-321-2004. Copies of the document can be found at the Information Repositories identified at the end of this document or viewed online at http://www.hanford.gov/calendar under the Public Comment Period section.

Public Meeting: At this time, no public meeting is scheduled on the Proposed Plan. To request a public meeting contact Craig Cameron at (509) 376-8665 by January 7, 2005.

This Proposed Plan is issued by the U.S. Environmental Protection Agency (EPA), the Washington State Department of Ecology (Ecology), and the DOE. These three agencies are referred to as the Tri–Parties. The EPA and Ecology are the joint lead regulatory agencies for the 221–U Facility. The role of the regulatory agencies is to oversee the activities at a remedial action site to ensure that all applicable requirements are met. The DOE is responsible for performing the selected remedial action.

Figure 1. Hanford Site Location Map.

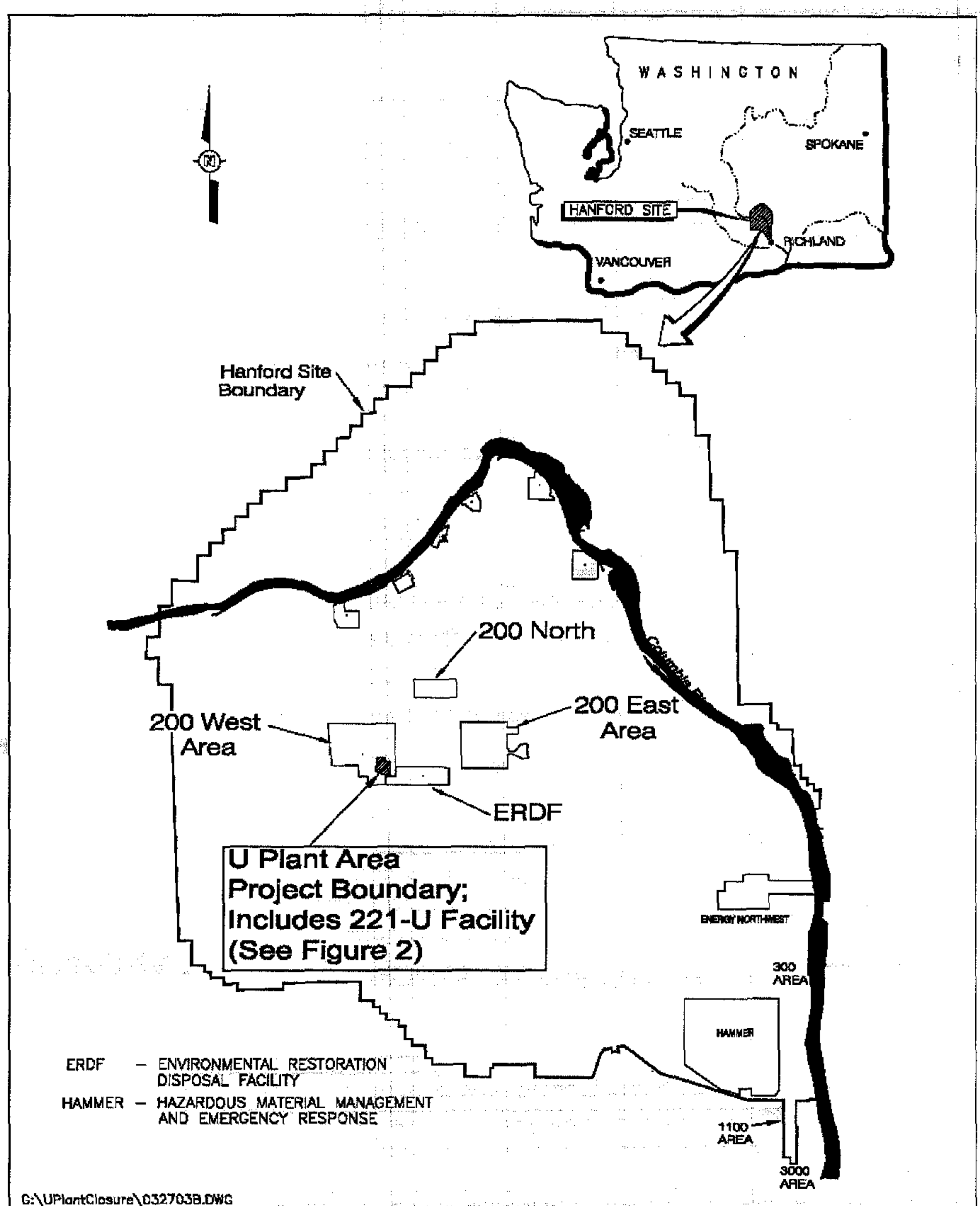
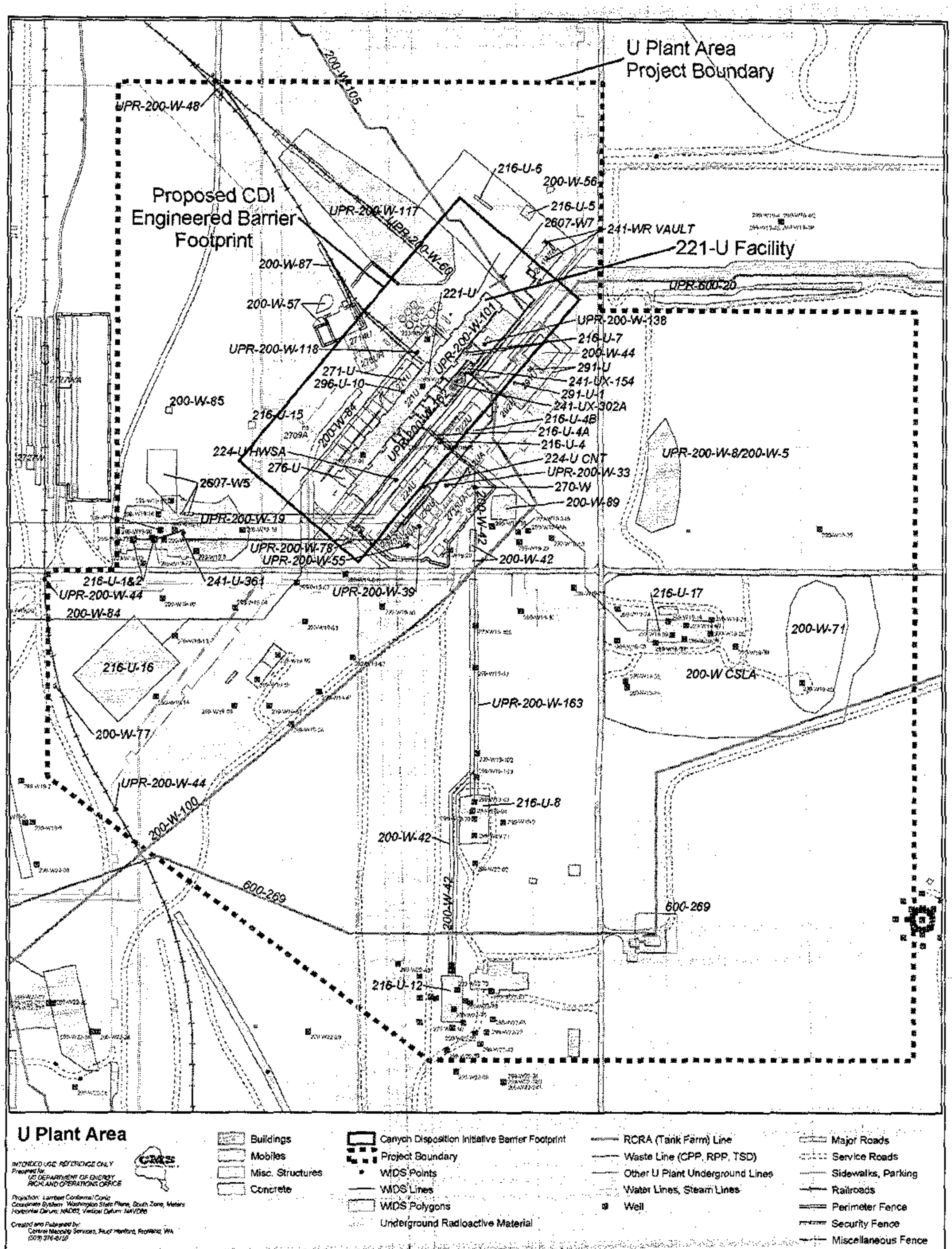


Figure 2. 221–U Facility with Adjacent Waste Sites and Ancillary Facilities.



The *Hanford Federal Facility Agreement and Consent Order*, known as the **Tri-Party Agreement**, governs cleanup of the Hanford Site. Section 8 of the Tri-Party Agreement identifies the 221-U Facility as a key facility subject to a process by which facilities are taken from operational status to their final end state condition. The Tri-Parties have determined in an *Agreement In Principle* (DOE-RL 1996) that the CERCLA process will be followed to evaluate potential cleanup remedies and identify a preferred alternative for the final end state for the five major **canyon buildings** in the 200 Areas of the Hanford Site. This evaluation was completed for one of the canyon buildings, the 221-U Facility, in the *Final Feasibility Study for the Canyon Disposition Initiative (221-U Facility)* (DOE/RL-2001-11, Rev. 1) (**feasibility study**). This Proposed Plan presents a summary of the results of the evaluation included in the feasibility study and proposes a preferred alternative for the 221-U Facility. A final remedy under the CERCLA process will be selected only after the public comment period has ended and the comments received have been reviewed and considered.

After reviewing all public comments, the Tri-Parties may select the proposed preferred alternative or another alternative, or a combination of alternatives presented in this Proposed Plan. Written comments on this Proposed Plan must be submitted by January 31, 2005 (See box on page 1). If requested, a public meeting will be held to explain the content of this Proposed Plan and to receive oral public comments.

Tri-Party responses to significant comments will be presented in a Responsiveness Summary that will be part of a final **Record of Decision (ROD)** for the 221-U Facility.

CANYON DISPOSITION INITIATIVE

The Canyon Disposition Initiative (CDI) is the result of the 1996 *Agreement in Principle* among the Tri-Parties to define the path forward for determining the final disposition for Hanford's five canyon buildings. The purpose of the CDI is to investigate the potential for using the canyon buildings as disposal sites for Hanford Site remediation waste, rather than demolishing the structures and transferring the resulting waste to another disposal facility.

The 221-U Facility is the first canyon building to be addressed under the CDI. The process to disposition the 221-U Facility is considered to be a pilot project for the remaining four canyon buildings. However, because of varying amounts, types, and locations of radiological contamination within the five canyon buildings, the complexity and costs for implementation could vary significantly for each building. Therefore, remedial alternatives and the selected remedy for the 221-U Facility may not be the same as those to be determined for the other canyon buildings.

The *Phase I Feasibility Study for the Canyon Disposition Initiative (221-U Facility)* (DOE/RL-97-11, Rev. 1) was completed to assess and screen an initial, wide range of alternatives for remediation of the 221-U Facility. The Phase I study concluded with a set of potential alternatives that were feasible for 221-U Facility remediation. These alternatives were then analyzed in detail in the *final feasibility study* (DOE/RL-2001-11, Rev. 1).

The remedial action alternatives summarized in this Proposed Plan include complete removal of the structure and its associated contamination, as well as three **containment alternatives** that would leave existing contamination in place. Two of the containment alternatives would reuse varying portions of the facility's internal and external areas for the disposal of other Hanford Site remediation waste. Details on each of the alternatives for 221-U Facility remediation can be found in the feasibility study, in other documents contained in the **Administrative Record** file, and later in this Proposed Plan. The public is encouraged to review the feasibility study to gain a more comprehensive understanding of the 221-U Facility and the remediation alternatives presented.

SITE BACKGROUND

The Hanford Site

The Hanford Site (Figure 1) is a 1,517-km^2 (586-mi^2) federal facility located in southeastern Washington State along the Columbia River. From 1943 to 1990, the primary mission of the Hanford Site was the production of nuclear materials for national defense. In July 1989, the 100, 200, and 300 Areas[3] of the Hanford Site were placed on the **National Priorities List (NPL)** pursuant to CERCLA.

[3] The 400 and 600 Areas are other Hanford Site areas that were not identified as separate NPL sites. Any waste sites within these areas are addressed under one of the other NPL sites. The 1100 Area was removed from the NPL in 1996.

200 West Area and U Plant Area

The 200 West Area is a DOE–controlled area of approximately 8.3 km^2 (3.2 mi^2) near the middle of the Hanford Site (Figure 1). The 200 West Area is about 8 km (5 mi) from the Columbia River and 11 km (6.8 mi) from the nearest Hanford Site boundary. The area contains waste management facilities and former irradiated–fuel reprocessing facilities. The 200 West Area is located on an elevated, flat area, often referred to as the Central Plateau. The underlying unsaturated zone (also called the **vadose zone**) is relatively thick, ranging from less than 50 m (165 ft) to more than 100 m (328 ft) in thickness. Groundwater in the 200 Areas is contaminated and is not withdrawn for beneficial uses.

Within the 200 West Area, the U Plant Area is approximately 0.76 km^2 (0.3 mi^2) and consists of the 221–U Facility, facilities that are ancillary or related to the 221–U Facility, underground pipelines, soil waste sites, and the groundwater underlying the area. The depth to groundwater near the 221–U Facility measures approximately 79 m (260 ft), and the flow direction is to the south–southeast. The water table beneath the 200 West Area is currently dropping at a rate of less than 0.5 m/yr (1.6 ft/yr). The groundwater beneath the U Plant Area has elevated levels of nitrates, technetium–99, and uranium due to past liquid discharges from the U Plant Area facilities and other 200 Area facilities. Monitoring and remediation of groundwater located under the U Plant Area are being addressed by the 200–UP–1 **Operable Unit** (EPA/541/R–97/048, *Record of Decision for the 200-UP–1 Interim Remedial Measure*).

It is anticipated that separate RODs will address the 221–U Facility and the U Plant Area soil waste sites, and that separate engineering evaluations/cost analyses and action memoranda will address ancillary facilities and pipelines. As separate cleanup strategies are developed for each of these components, proposed cleanup decisions will be presented to the public for review and comment. The goal of the integrated area–based cleanup approach is to select and implement actions necessary for cleanup and to protect human health and the environment for the entire U Plant Area.

The 221–U Facility

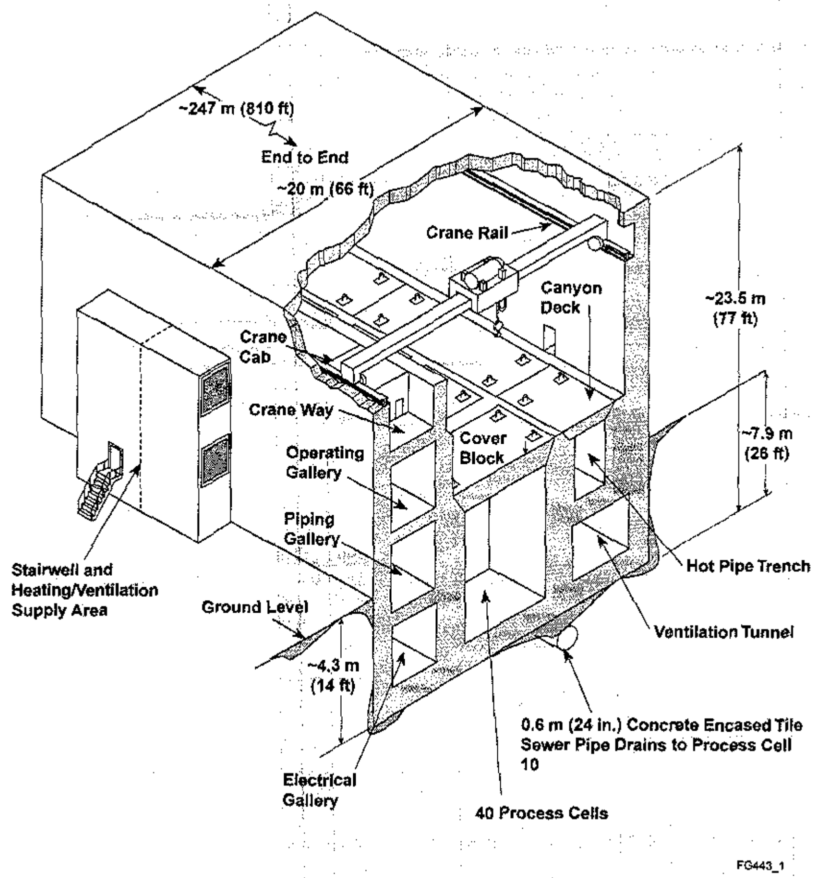
The 221–U Facility, located within the U Plant Area (Figures 1 and 2), is one of three nearly identical Hanford Site chemical separations plants constructed from 1944 through 1945 to support World War II plutonium production. The 221–U Facility was built to extract plutonium from fuel rods irradiated in the Hanford Site production reactors. However, the 221–U Facility was never used for this purpose because canyon buildings constructed earlier met the Hanford Site's production goals. The 221–U Facility instead was used to train B and T Plant operators until 1952. At that time, it was converted to include a uranium recovery process for waste from other canyon facilities. Process equipment was transferred from other canyon facilities and included remote–handled materials and transuranic (TRU) contaminated materials. A cross section of the 221–U Facility is shown in Figure 3.

Remedial investigation and characterization activities in support of the 221–U Facility feasibility study indicate that the 221–U Facility contains various levels of radiologically contaminated soil, equipment, fission products, contaminated building materials, and/or miscellaneous debris from the fuels reprocessing. Results of the environmental characterization effort, presented in the *Final Data Report for the 221-U Facility Characterization* (BHI-01565, Rev. 0) identified liquid in a tank in process cell 30 that has TRU isotope concentrations significantly greater than 100 nanocuries per gram, as well as several other locations with TRU concentrations in samples slightly above the 100 nanocuries per gram level. Complete results of the environmental sampling effort, as well as structural engineering evaluations, are summarized in the feasibility study for the 221-U Facility (DOE/RL-2001-11).

The 221–U Facility was determined to be a contributing property within the Hanford Site Manhattan Project and Cold War Era Historic District, but was not selected for mitigation. Historic artifacts identified within the structure have been documented in photographs and selectively tagged for preservation.

The 221–U Facility and surrounding areas have been disturbed by industrial activities and have little vegetative cover. Public access to the 221–U Facility is prohibited at the present time.

Figure 3. Cross-Section of the 221-U Facility.



SITE CHARACTERISTICS

The Hanford Site has a semi-arid climate (average annual precipitation of 16 cm [6.3 in.]) with seasonal high **evapotranspiration** rates and periodic high winds. The **potential evapotranspiration (PET)** rate averages approximately 127 cm/yr (50 in/yr). The *Hanford Comprehensive Land-Use Plan Environmental Impact Statement* (land-use EIS) (DOE/EIS-0222-F) and associated ROD, "Record of Decision: Hanford Comprehensive Land Use Plan Environmental Impact Statement" *(64 FR 61615)* issued in 1999, and *The Future for Hanford: Uses and Cleanup, the Final Report of the Hanford Future Site Uses Working Group* (Drummond 1992), have identified the area encompassed by the 221-U Facility as an industrial land use area. In the land-use EIS, this area is designated "industrial-exclusive" and is defined as "land areas suitable and desirable for treatment, storage, and disposal of hazardous, dangerous, radioactive, nonradioactive wastes, and related activities."

Potential contaminants to be addressed include substances currently present within the canyon building and those associated with wastes that would be received under the two containment alternatives being considered that include disposal of waste received from other CERCLA cleanup actions at Hanford. (See "Summary of Remedial Alternatives" later in this Proposed Plan.) The predominant **contaminants of concern** are radionuclides. Radionuclides currently within the 221-U Facility that are considered to be of concern are americium-241; cesium-137; cobalt-60; neptunium-237; plutonium-239/240; strontium-90; and isotopes of europium, thorium, and uranium. Chemical contaminants of concern currently within the facility are antimony, arsenic, barium, cadmium, chromium, lead, mercury, phthalates, polychlorinated biphenyls, selenium, silver, and uranium.

Note that the two remedial alternatives that include waste disposal would deal with waste forms similar to those accepted at DOE's existing **Environmental Restoration Disposal Facility (ERDF)**, located in the central part of the Hanford Site (Figure 1). For these two remedial alternatives, like the ERDF, waste forms received would come from CERCLA cleanup actions at Hanford. Therefore, based on analyses of materials disposed at the ERDF to date, the following additional radionuclides and nonradionuclides would be contaminants of concern for the two alternatives that would use the 221–U Facility as a disposal facility: carbon–14, technetium–99, tritium, beryllium, petroleum hydrocarbons, and polyaromatic hydrocarbons.

SCOPE AND ROLE OF ACTION

The 221–U Facility feasibility study addressed five alternatives for remedial action. The earlier Phase I feasibility study identified two other alternatives that were not recommended for further study. These were Alternatives 2 (Decontaminate and Leave in Place) and 5 (Close in Place – Standing Structure), which were considered either not protective (Alternative 2) or not viable (Alternative 5). Only Alternatives 0 (as a baseline), 1, 3, 4, and 6 were carried forward into the final feasibility study and this Proposed Plan. These alternatives are as follows:

- Alternative 0: No Action
- Alternative 1: Full Removal and Disposal
- Alternative 3: Entombment with Internal Waste Disposal
- Alternative 4: Entombment with Internal/External Waste Disposal
- Alternative 6: Close in Place – Partially Demolish.

See the "Summary of Remedial Alternatives" later in this Proposed Plan for a detailed description of the remedial Alternatives. This Proposed Plan presents a summary of the evaluation of these alternatives and selects the preferred alternative (or combination of alternatives) for remedial action at the 221–U Facility. The scope of this remedial action addresses only the 221–U Facility (which includes the 271–U Support Services Building and the 276–U Solvent Handling Facility).

The role of the proposed remedial action is to address potential future threats to human health and the environment associated with hazardous substances in the 221-U Facility. Cleanup actions on soil waste sites, ancillary facilities, and pipelines in the U Plant Area are also currently being evaluated as separate and integrated CERCLA actions.

SUMMARY OF SITE RISK

The Tri–Parties believe that action is necessary to protect human health or welfare and the environment from actual or threatened releases of hazardous substances into the environment from the 221–U Facility. Such a release, or threat of release, may present an imminent and substantial endangerment to public health, welfare, or the environment.

Land Use

Site risks were evaluated based on a reasonably anticipated future land use for the Central Plateau. These evaluations were based on the criteria presented in and are consistent with the Hanford Advisory Board (HAB) Advice #132 (http://www.hanford.gov/boards/hab/advice/habadv-132.pdf), and the Tri-Parties' response to that advice (http://www.hanford.gov/boards/hab/advice/habresp-132.pdf).

The Board acknowledges that some waste within acceptable levels will remain in the industrial-exclusive use core zone of the Central Plateau when cleanup is complete. The goal identified within the HAB advice is that the core zone be as small as possible and not include contamination outside the Central Plateau fenced areas.

The DOE is expected to continue industrial-exclusive activities for at least 50 years, in accordance with the land-use EIS (DOE/EIS-0222-F), and Record of Decision (64 FR 61615).

Based on these discussions with the HAB, the alternative risk evaluations used the following anticipated land use assumptions:

- The core zone will have an industrial land use for the foreseeable future. The risk evaluations assume an:
  - Industrial-exclusive use for the next 50 years (through 2050), and
  - Industrial land use (non-DOE worker) for 100 years after that (through 2150).
- For groundwater, the risk evaluations assume:
  - No consumptive use of groundwater for the next 150 years, based on the expected period

of waste management and active **institutional controls**, and

– Any selected remedy will provide for no further degradation of groundwater from the *221-U Facility*

In addition, risks were calculated considering the possibility of an inadvertent intruder beginning 150 years from the year 2000 (in 2150), because of the increasingly possible loss of institutional controls after that date. The potential risk from an inadvertent intruder was evaluated for informational purposes only and is not required by regulation.

Human Health Risk

In the Superfund process, potential risks to human health and the environment are evaluated to determine if significant risks exist due to site contaminants. Excess cancer risks are expressed exponentially as 1×10^{-4}, 1×10^{-5}, and 1×10^{-6} (i.e., one in ten thousand, one in one hundred thousand, one in a million, respectively). This means that for a 1×10^{-4} risk, if 10,000 people were exposed to a contaminant of concern for some period of time, one additional person may be diagnosed with cancer in his/her lifetime. Remedial actions generally are not required at risk levels between 1×10^{-4} and 1×10^{-6} unless there are other considerations such as adverse environmental impacts, the potential for future migration, or uncertainty regarding future land use.

Contamination at the 221–U Facility poses the potential for increased human health risk to future site users as the facility ages and deteriorates. The level of potential health risk posed by the facility differs depending on the future site use. Two exposure scenarios were evaluated for the 221–U Facility: an **industrial scenario** and an **inadvertent intruder scenario**.

These two scenarios were evaluated in accordance with the HAB Advice #132 and the response to the advice. The scenarios were used to assess risks first without remedial action, and then for the post-remediation case. The application of the scenarios included:

- Baseline risk (without remedial action) assessment was performed using the industrial scenario to establish if acceptable risk levels were exceeded, justifying remedial action. The maximum baseline risk exposure was associated with the industrial scenario. The inadvertent intruder scenario was considered for information only.
- Cleanup goals were calculated based on the industrial scenario.
- Post-remediation risk was evaluated using the inadvertent intruder scenario at a future time.

In both scenarios, future users could be exposed to contaminants in the facility through external exposure to radiation and ingestion or inhalation of particulate released from the facility when present containment structures fail. Air, biota, and groundwater would be secondary media of concern because the likelihood of these media becoming contaminated is less and/or the magnitude of their potential contamination is small because the existing contamination is present as solids.

The baseline (with no cleanup) risk assessment results show that the contaminants at the 221–U Facility which have the highest contribution to potential increased human health risks include various radionuclides (americium–241, cesium–137, cobalt–60, europium-154, neptunium–237, plutonium–239/240, strontium–90, and uranium isotopes) and heavy metals (lead, mercury, and uranium). The total incremental cancer risk (ICR) of the radionuclides at concentrations measured at the 221–U Facility is greater than 10^{-2}.

Concentrations and risk ranges are presented in Table 1. The baseline risks of most of the 221–U Facility constituents presented in Table 1 are greater than acceptable risk levels; therefore, remedial action is necessary. Materials contaminated by these constituents include concrete, metallic waste, containerized materials, and miscellaneous debris currently contained within the structure of the 221–U Facility.

Uncertainties with the exact nature of future industrial and inadvertent intruder exposures may lead to under- or overestimation of human health risk. Another significant source of uncertainty is the limited sampling data. Because the investigation and sampling focused on the most highly radioactive wastes in the facility and the risk assessment assumed that these wastes were present throughout the facility, the risk assessment is more likely to overestimate the potential human health risk.

Table 1. Representative Risks of 221–U Facility Contaminants.

Contaminant	95% UCL of Contaminant Concentrations[a]	Human Health Risk[b] (Industrial Scenario)
Nonradionuclides		
Antimony	2.96 +/– 0.14 mg/kg	HI = 0.07 +/– 0.02
Arsenic	50.3 +/– 23.3 mg/kg	HI = 2 +/– 1; ICR = 7.6×10^{-5} +/– 3.5×10^{-5}
Barium	387 +/– 196 mg/kg	HI = 0.07 +/– 0.04
Cadmium	5.54 +/– 0.33 mg/kg	HI = 0.33 +/– 0.01; ICR = 1.7×10^{-4} +/– 3.5×10^{-5}
Chromium	2,100 +/– 349 mg/kg	HI = 0.018 +/– 0.003
Lead	1,140 +/– 125 mg/kg	Not Applicable[c]
Mercury	1,190 +/– 117 mg/kg	HI = 50 +/– 5
Selenium	0.225 +/– 0.053 mg/kg	HI = 0.0006 +/– 0.0001
Silver	24.7 +/– 1.9 mg/kg	HI = 0.062 +/– 0.005
Uranium	8,260 +/– 1,400 mg/kg	HI = 34 +/– 6
		HQ = 87 +/– 12
		Total ICR = 2.5×10^{-4} +/– 0.7×10^{-4}
Radionuclides		
Americium–241	$6.4 \times 10^{+6}$ +/– $3.1 \times 10^{+6}$ pCi/g	ICR > 10^{-2}
Cesium–137	$2.4 \times 10^{+8}$ +/– $0.4 \times 10^{+8}$ pCi/g	ICR > 10^{-2}
Cobalt–60	$9.4 \times 10^{+3}$ +/– $1.4 \times 10^{+3}$ pCi/g	ICR > 10^{-2}
Europium–154	$3.3 \times 10^{+5}$ +/– $0.9 \times 10^{+5}$ pCi/g	ICR > 10^{-2}
Neptunium–237	$7.1 \times 10^{+4}$ +/– $4.6 \times 10^{+4}$ pCi/g	ICR > 10^{-2}
Plutonium–238	$5.4 \times 10^{+2}$ +/– $0.8 \times 10^{+2}$ pCi/g	ICR = 3.9×10^{-5} +/– 0.5×10^{-5}
Plutonium–239	$1.4 \times 10^{+7}$ +/– $0.3 \times 10^{+7}$ pCi/g	ICR > 10^{-2}
Plutonium–240	$3.3 \times 10^{+6}$ +/– $0.6 \times 10^{+6}$ pCi/g	ICR > 10^{-2}
Strontium–90	$2.3 \times 10^{+8}$ +/– $0.6 \times 10^{+8}$ pCi/g	ICR > 10^{-2}
Thorium–230	$1.1 \times 10^{+1}$ +/– $0.2 \times 10^{+1}$ pCi/g	ICR = 4.5×10^{-6} +/– 0.6×10^{-6}
Uranium–234	$6.1 \times 10^{+3}$ +/– $2.2 \times 10^{+3}$ pCi/g	ICR = 2.7×10^{-4} +/– 1×10^{-4}
Uranium–235	$6.0 \times 10^{+2}$ +/– $3.6 \times 10^{+2}$ pCi/g	ICR = 1.9×10^{-3} +/– 1.1×10^{-3}ICR = 2.8×10^{-3} +/–
Uranium–238	$4.0 \times 10^{+3}$ +/– $1.1 \times 10^{+3}$ pCi/g	0.8×10^{-3}
		Total ICR > 10^{-2}

[a] 95% upper confidence limit (UCL) values for individual contaminants are calculated as described in *Statistical Guidance for Ecology Site Managers*, Ecology Pub. #92–54, Washington Department of Ecology, Olympia, Washington. They were used to calculate risks as described in Appendix A of the feasibility study.
[b] Numerical values are not reported for risks greater than 10^{-2} because the linear equation for risk estimation is only valid for contaminant intakes resulting in calculated risks below 10^{-2}.
[c] Calculation of risk indices is not applicable to lead because lead is a neurotoxin with soil cleanup levels defined by the EPA's *Integrated Exposure Uptake Biokinetic Model for Lead in Children* available on the internet at http://www.epa.gov/superfund/programs/lead/products/htm
\> = greater than
HI = hazard index
HQ = hazard quotient = sum of hazard indices
ICR = incremental cancer risk
UCL = upper confidence limit

Ecological Risk

The 221–U Facility is within the industrial exclusive core zone identified in the land-use EIS (DOE/EIS-0222–F). The area immediately surrounding the 221–U Facility is highly disturbed and thus provides reduced–quality habitat for ecological communities and the establishment of food webs with a hierarchy of terrestrial receptors. In addition, there is little likelihood of ecological exposure to 221–U Facility contaminants via intrusion or releases at the present time. However, if remedial alternatives are not implemented and no action is taken with the existing 221-U structure, the possibility of exposure will increase over time as the facility ages and deteriorates, and as ecological habitat is naturally restored over time.

Ecological risk in the 200 Areas, including the 221–U Facility, has been further considered in the *Central Plateau Ecological Evaluation Report*

(DOE/RL-2001-54, Rev. 0), a compilation and evaluation of available ecological sampling data for the 200 Areas Central Plateau of the Hanford Site. The report reviews ecological sampling data that have been collected over many years from undisturbed and disturbed habitats in the 200 Areas. An ecological survey of the 200 Areas, performed in 2000 and 2001, is included, providing a detailed current description of the ecological setting of the Central Plateau.

The ecological risk assessment identifies exposure pathways for ecological receptors and evaluates potential risk from those exposures. Simplified terrestrial ecological evaluation procedures described in the State of Washington's *Washington Administrative Code* (WAC) 173–340–7492(2) have been used to develop soil cleanup level **preliminary remediation goals (PRGs)** for terrestrial wildlife protection on industrial properties. The placement of an engineered barrier under containment alternatives would be designed to sever all exposure pathways, and along with the concrete structure and the grout filled void spaces, would greatly reduce the probability and degree of impacts to human and ecological receptors.

REMEDIAL ACTION OBJECTIVES

Remedial action objectives (RAOs) provide general descriptions of what the remedial action will accomplish (e.g., restoration of a waste site). They also specify remediation goals so that an appropriate range of remedial options can be developed for evaluation. The RAOs for the 221–U Facility are as follows:

RAO 1: Prevent unacceptable health and occupational risks to workers from physical, chemical, and radiological hazards posed by the 221–U Facility.

RAO 2: Prevent unacceptable risk to human health, ecological receptors, or natural resources associated with external exposure to, ingestion of, inhalation of, and dermal contact, with 221–U Facility contents at levels that exceed **applicable or relevant and appropriate requirements (ARARs)** or risk–based criteria.

RAO 3: Prevent the migration of contaminants through the soil column to groundwater such that no further degradation of groundwater occurs due to leaching from the 221-U Facility.

RAO 4: Minimize physical, ecological, or cultural impacts caused by remediation of the 221–U Facility or by use of the 221–U Facility as a disposal facility.

PRELIMINARY REMEDIATION GOALS

PRGs have been developed for evaluating the extent of remediation required under Alternatives 1 and 6. (See "Summary of Remedial Alternatives" later in this Proposed Plan for a description of remedial Alternatives 1, 3, 4, and 6.)

PRGs for Alternatives 1 and 6 are presented in Table 2. These values are based on acceptable levels of human health and ecological risk. Typically, PRGs are identified for individual hazardous substances. If multiple contaminants are present at a site, the suitability of using individual PRGs as final cleanup values protective of human health and the environment is evaluated based on site–specific information and the potential for contaminant interaction. Specific PRGs applicable to achieving one or more of the 221–U Facility's RAOs are based on the following guidance and potential ARARs. For direct exposure, the following would apply:

- For radionuclides, the CERCLA risk range of 10^{-4} to 10^{-6} increased cancer risk (40 CFR 300.430), using 15 mrem per year dose as a guideline to meet this risk range.
- Risk–based standards were calculated using WAC 173–340–745(5)(b)(iii)(B) equations for nonradioactive contaminants.

For soil concentrations that would be most protective of groundwater and the Columbia River, the most stringent of the following would apply:

- Maximum contaminant levels (MCLs) as promulgated under the Federal *Safe Drinking Water Act* (40 *Code of Federal Regulations* [CFR] 141) (for most radionuclides, MCLs correspond to 4 mrem/yr) and/or the State of Washington's drinking water standards (WAC 246–290)
- Ambient water quality criteria developed under the Federal *Clean Water Act* (40 CFR 131) and/or surface water quality standards promulgated by the State of Washington (WAC 173–201A)
- The State of Washington's risk–based standards for calculating groundwater and surface water standards (WAC 173–340–720[4])
- The State of Washington's risk–based standards for deriving soil concentrations for groundwater and surface water protection (WAC 173–340–747[4]).

Table 2. Summary of Preliminary Remediation Goals for All Pathways.

Nonradionuclides					
Constituent	**Overall Most Restrictive PRG [a] (mg/kg)**	**Driver for Most Restrictive PRG**	**Constituent**	**Overall Most Restrictive PRG [a] (mg/kg)**	**Driver for Most Restrictive PRG**
Antimony	5.4	Groundwater Protection	Nitrate	40	Groundwater Protection
Arsenic	20	Terrestrial Wildlife Protection	Nitrite	4	Groundwater Protection
Beryllium	31.6	River Protection	Petroleum hydrocarbons	2,000	Groundwater Protection
Cadmium	0.81	Background	Phthalates	8.01	River Protection
Chromium (III)	135	Terrestrial Wildlife Protection	Polycyclic aromatic hydrocarbons	0.040	River Protection
Chromium (VI)	3.85	River Protection	Polychlorinated biphenyls	0.0021 [b]	River Protection
Fluoride	16	Groundwater Protection	Sulfate	1,000	Groundwater Protection
Lead	220	Terrestrial Wildlife Protection	Uranium	3.21	Background
Mercury	0.33	Background	--	--	--
Radionuclides					
Constituent	**Overall Most Restrictive PRG [a] (pCi/g)**	**Driver for Most Restrictive PRG**	**Constituent**	**Overall Most Restrictive PRG [a] (pCi/g)**	**Driver for Most Restrictive PRG**
Americium-241	335	Direct Exposure	Plutonium-239/240	425	Direct Exposure
Carbon-14	14.9	Groundwater Protection	Strontium-90	2410	Direct Exposure
Cesium-137	23.4	Direct Exposure	Technetium-99	6.16	Groundwater Protection
Cobalt-60	4.90	Direct Exposure	Thorium-228	7.73	Direct Exposure
Europium-152	11.4	Direct Exposure	Thorium-232	4.80	Direct Exposure
Europium-154	10.3	Direct Exposure	Tritium (H-3)	150	Groundwater Protection
Europium-155	426	Direct Exposure	Uranium (total)	2.27	Direct Exposure
Neptunium-237	59.2	Direct Exposure	--	--	--

[a] Listed values represent the most restrictive soil PRG derived from evaluation of direct contact, groundwater protection, Columbia River protection, and terrestrial wildlife protection per the feasibility study.

[b] This value was derived using the Model Toxics Control Act (MTCA) fixed parameter three-phase partitioning model. MTCA (WAC 173-340) allows a variety of methods to be used to establish soil concentrations that will be protective of the groundwater, including using site-specific data in the three-phase model and alternative fate and transport models. Any of these methods may be used if this cleanup level is a critical factor in remedy decisions.

pCi/g = picocuries per gram.

Meeting PRGs and, by extension, achieving RAOs, can be accomplished by reducing the concentration (or radiological activity) of chemical and radiological contaminants to remediation goal levels or by eliminating potential exposure pathways. Contaminant–specific, numeric soil PRGs for direct exposure and protection of groundwater and the Columbia River are typically presented as concentration (mg/kg) or radiological activity (pCi/g). Final remediation goals will be specified in the ROD for the 221–U Facility. In all cases, site–specific modeling will be performed during remedial design to verify that residual concentrations of immobilized contaminants in the 221-U Facility will be protective of groundwater.

Because there are no low–level waste streams at this time with quantifiable volumes and waste characteristics that can be specifically identified for 221–U Facility disposal under Alternatives 3 and 4, determination of PRG's is not possible for these two alternatives. If either Alternative 3 or 4 were to be selected as the preferred alternative, detailed information on waste forms and a radiological inventory would be gathered after the ROD is issued. This information would support a rigorous analysis to establish facility–specific waste acceptance criteria and risk assessment parameters. These data would be submitted to the regulatory agencies and DOE for technical review and concurrence.

SUMMARY OF REMEDIAL ALTERNATIVES

The 221–U Facility feasibility study addressed one "inactive" alternative, (the No Action baseline, Alternative 0), and four "active" alternatives (Alternatives 1, 3, 4, and 6). The four active alternatives share "common elements" to achieve the 221–U Facility RAOs. The common elements include institutional control and, for Alternatives 3, 4, and 6, an engineered barrier and post–closure barrier monitoring. In addition, post–remediation groundwater monitoring for Alternatives 3, 4, and 6 includes upgradient and downgradient groundwater monitoring wells, maintenance of all monitoring wells, periodic replacement of monitoring wells, periodic groundwater monitoring, and annual reporting.

Common elements of the alternatives are summarized in Table 3. The footprint of the engineered barrier would be adjusted slightly for Alternatives 3, 4, or 6 to accommodate requirements for planned remediation of nearby facilities, waste sites and pipelines. For example, coverage by the CDI engineered barrier also could be the preferred remedy for some facilities, waste sites or pipelines as part of other ongoing CERCLA actions in the U Plant Area. The specific engineered barrier design and layout will be developed during remedial design.

For Alternatives 1, 3, 4, and 6, wastes with transuranic isotope concentrations greater than 100 nanocuries per gram after stabilization, such as liquid identified in a tank in process cell 30, would be considered TRU waste and will be removed and dispositioned. Most likely, the material would be pumped into small geometrically favorable (for criticality) containers with absorbents or grouted to stabilize the liquid. The material would then be overpacked, as needed, into shielded containers and sent to the Hanford Central Waste Complex for interim storage. The TRU waste will be shipped to the Waste Isolation Pilot Plant near Carlsbad, New Mexico, in accordance with an approved work plan and the schedule established for completing remedial actions, no later than September 30, 2024. Additional TRU wastes found during remedial activities would be removed and stored at the Hanford Central Waste Complex and disposed offsite.

Alternative 0: No Action Alternative

The "National Oil and Hazardous Substances Contingency Plan" (NCP) (40 CFR 300) requires that a No Action alternative be evaluated as a baseline for comparison with other remedial alternatives. Alternative 0 represents a situation where no legal restrictions, access controls, or active remedial measures are applied to the site. No Action implies allowing the wastes to remain in their current configuration, affected only by natural processes and without benefit of surveillance or maintenance activities. Selecting Alternative 0 as the preferred alternative would require agreement that the 221–U Facility poses no unacceptable threat to human health or the environment when, in fact, existing contamination poses the potential for increased human health risk to future site users because of the likelihood of breaching the present containment as the facility ages and deteriorates, allowing migration of contaminants to the environment.

Table 3. Common Elements of the Active Remedial Alternatives for the 221–U Facility.

Element	Description
Remedial Activity	All alternatives will require common steps to: • stabilize and disposition identified transuranic material; • upgrade and maintain the existing roof cover; as necessary, • grout the concrete–encased cell drain header and ventilation tunnel; • size reduce and dismantle equipment currently on the canyon deck; • stabilize or remove contamination on the canyon walls, floor, roof, cells, hot pipe trench, and equipment; • decontaminate the outer 22.9 m (75 ft) of the railroad tunnel and wing walls; • demolish the 276–U Solvent Recovery Facility, the 271–U Office Building, and front and rear stairs of the 221–U Facility • install an engineered barrier for the containment response actions.
Institutional Controls	Institutional controls are an integral part of the active response actions. These controls would be required during and after complete source removal (Alternative 1) to ensure that future land use remains consistent with the industrial scenario. For containment alternatives, more robust institutional controls would be required to ensure, among other things, that engineered barriers are properly maintained. Methods of precluding unintentional trespassing and controlling access to waste sites might include signs, entry control, excavation permits, artificial or natural barriers, and active surveillance. Legal restrictions on the use of land and groundwater would be imposed (e.g., prohibit irrigation and well drilling).
Monitoring	This remedial action component is a common element for all alternatives. Alternative 1 relies upon the 200–UP–1 groundwater operable unit and the U Plant Area project for post–remediation groundwater monitoring.. For Alternatives 3, 4, and 6, a performance monitoring system that detects moisture movement through the barrier would be installed, thereby allowing various appropriate mitigative measures/best management practices to be implemented to mitigate or prevent percolating water from reaching the underlying waste (e.g. thickening of barrier, runon/runoff water flow controls). The final design of the engineered barrier will provide the specific details on engineered features to accomplish any performance monitoring. Post–remediation groundwater monitoring for Alternatives 3, 4, and 6 includes upgradient and downgradient groundwater wells. Key elements of groundwater monitoring activities include maintenance of all groundwater monitoring wells, periodic replacement of monitoring wells, periodic groundwater monitoring, and annual reporting. The specific monitoring system design and its requirements would be established as part of an operations and maintenance plan and will be integrated with the 200–UP–1 groundwater operable unit, the U Plant Area project, and the 216-U-12 *Resource Conservation and Recovery Act of 1976* (RCRA) monitoring program.

Alternative 1: Full Removal and Disposal

In this alternative, the 221–U Facility structure and contents would be demolished, including the foundation below existing grade level. Structural material, facility contents, and associated soil above risk–based standards would be disposed at the ERDF. An estimated 78,000 m^3 (102,000 yd^3) of debris and soil would be disposed to the ERDF. Under Alternative 1, the ERDF would need to be expanded by about 12% of one cell to accommodate 221–U Facility waste. Most wastes would be expected to meet the waste acceptance criteria established for ERDF. If the ERDF waste acceptance criteria cannot be achieved, waste treatment to meet the ERDF waste acceptance criteria or disposal at another disposal facility would be required. Material to be disposed of would be segregated, evaluated for safe and economical reuse or recycle, and packaged and shipped to the disposal facility if it cannot be recycled or reused. The demolition excavation would then be backfilled to surrounding grade, and the disturbed area would be reseeded or otherwise resurfaced consistent with future land–use decisions. Alternative 1 would require approximately 89,000 m^3 (116,500 yd^3) of backfill materials. Institutional controls to maintain industrial land use would be required if unrestricted cleanup levels are not achieved by this alternative.

Alternative 3: Entombment with Internal Waste Disposal

This alternative would involve preparation of the 221–U Facility for internal placement of wastes from other CERCLA cleanup actions at Hanford. Approximately 3,400 m^3 (4,400 yd^3) of existing contaminated equipment from the canyon deck would be reduced in size and volume (e.g., cut up into smaller pieces) and then disposed to process cells of the facility. Approximately 10,100 m^3 (13,200 yd^3) of waste from other CERCLA actions would also be disposed in available remaining spaces within the 221–U Facility, resulting in a total waste disposal volume of up to 13,500 m^3 (17,600 yd^3). These wastes would be grouted to minimize the potential for void spaces and to reduce the mobility, solubility, and/or toxicity of the grouted waste. Grout amendments, such as fly ash or zeolite clays, and the cost–benefit of using a soil–cement grout mixture would be considered during final design for grouting activities to reduce the potential for leaching of radioactive isotopes, while maintaining desirable properties of Portland cement. A cross section of the interior waste fill plan under Alternative 3 is shown in Figure 4.

An estimated 10,000 m^3 (13,000 yd^3) of waste generated during building preparation for waste receiving operations, as well as soil from remediation of impacted adjacent waste sites and debris from demolition of impacted ancillary facilities would be disposed at the ERDF. These wastes would be sent to ERDF rather than disposed in the canyon for optimum handling, scheduling, and because other wastes would be better suited for more protective disposal in the grouted facility.

Concurrent with waste–filling operations, the entire 221–U Facility would be surrounded with compacted clean fill. The use of inert, uncontaminated rubble from other nearby CERCLA demolition activities, such as the ancillary facilities, suitable for fill material in the engineered barrier, will be considered during remedial design to decrease the amount of borrow materials needed. At completion of fill placement activities, the 221–U Facility would then be covered with an engineered barrier, such as shown in Figure 5, that will provide protection against water infiltration and human and biotic intrusion into the underlying waste.

Selection of the most appropriate engineered barrier will be made during final design. For cost–estimating purposes in the feasibility study, an evapotranspiration barrier has been used. The actual barrier configuration selected during final design would be designed to minimize the potential for earthquake–induced deformations that could compromise its integrity. The engineered barrier, would be designed to meet RAOs, ARARs, and provide long–term containment and hydrologic protection for a performance period of at least 500 years. Feasibility cost estimates for the barrier were based on barrier reconstruction at year 500 to extend the period of full containment to 1,000 years. The remedial design will evaluate barrier options that would minimize maintenance and reconstruction needs.

Water spraying would generally be used to control dust from materials associated with engineered barrier construction. Operation and maintenance activities would include regular inspections, cover vegetation management, regular environmental monitoring (e.g., groundwater and performance monitoring of the barrier) and maintenance as needed. Institutional controls, such as drilling restrictions, would be required. When complete, the top of the engineered barrier would be reseeded along with disturbed areas in the vicinity of the 221–U Facility. The side slopes of the barrier, may include 0.6 m (2 ft) of coarse riprap (Figure 5), however the remedial design will establish the specific erosion control design features.

The feasibility study assumes that most engineered barrier materials would be excavated with standard soil excavation equipment and transported to the 221–U Facility from borrow areas on the Hanford Site or within close proximity. Approximately 1.5 million m^3 (1.9 million yd^3) of borrow materials would be required to construct the engineered barrier. The facility, after placement of the engineered barrier, would be approximately 461 m (1,512 ft) in length by 234 m (768 ft) in width by 24 m (80 ft) high.

Alternative 4: Entombment with Internal/ External Waste Disposal

This alternative is identical to Alternative 3, except that the total waste disposal volume would be increased by 50,100 m^3 (65,463 yd^3) by modifying the external area around the perimeter of the 221–U Facility for disposal of contaminated soil from other CERCLA actions at Hanford. The barrier would provide containment to both interior and exterior waste fill (Figure 6). The disposal unit's exterior waste fill area will include as part of its design a **RCRA double liner and leachate collection system** to account for the potential to receive hazardous waste from CERCLA or RCRA past practice cleanups at Hanford in this portion of the facility. An estimated 10,000 m^3 (13,000 yd^3) of waste generated during building preparation for waste receiving operations, as well as soil from remediation of impacted adjacent waste sites and debris from demolition of impacted ancillary facilities would be disposed at the ERDF. These wastes would be sent to ERDF rather than disposed in the canyon for optimum handling, scheduling, and because other wastes would be better suited for more protective disposal in the grouted facility.

The use of inert, uncontaminated rubble from other nearby CERCLA demolition activities, such as the ancillary facilities, suitable for fill material in the engineered barrier, will be considered during remedial design. With the addition of the external disposal area, approximately 63,600 m^3 (82,700 yd^3) of waste could be disposed at the 221–U Facility under Alternative 4. Approximately 1.4 million m^3 (1.8 million yd^3) of borrow materials would be required to construct the engineered barrier. The facility, after placement of the engineered barrier, would be approximately 461 m (1,512 ft) in length by 234 m (768 ft) in width by 24 m (80 ft) high at existing grade.

Figure 4. Alternatives 3 and 4 – Cross Section of the 221–U Facility Interior Waste Fill Plan.

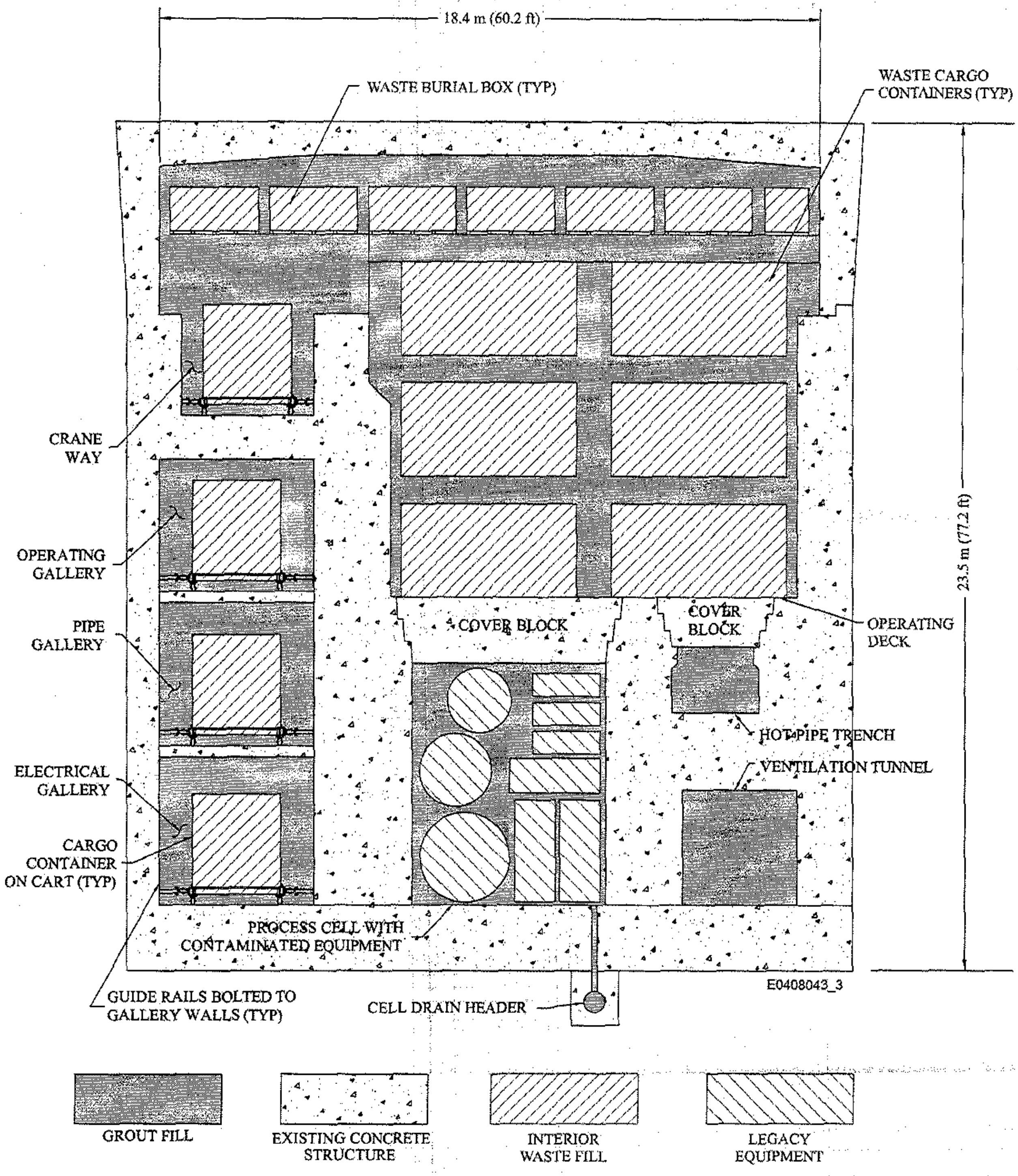


Figure 5. 221-U Facility Engineered Barrier Components.

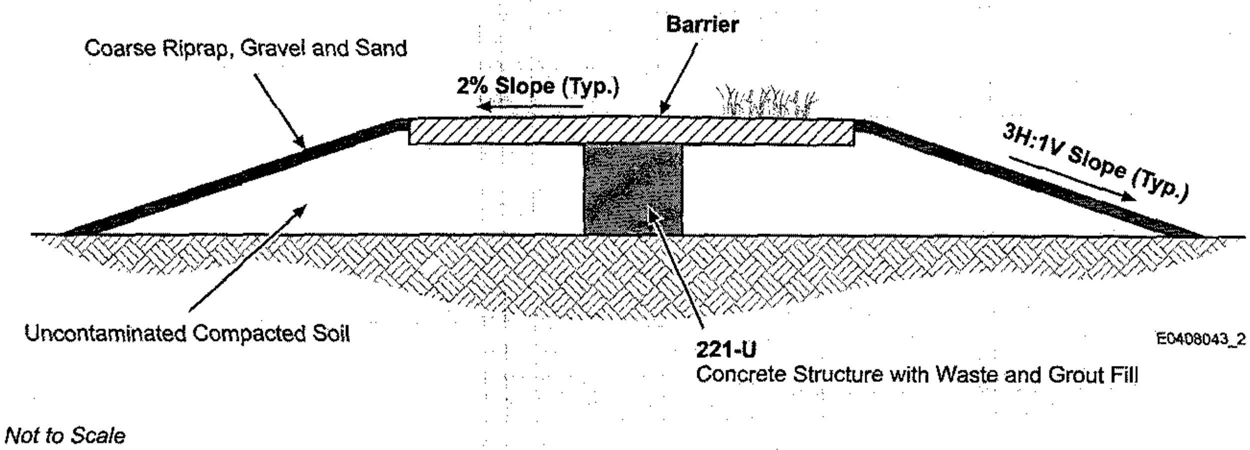
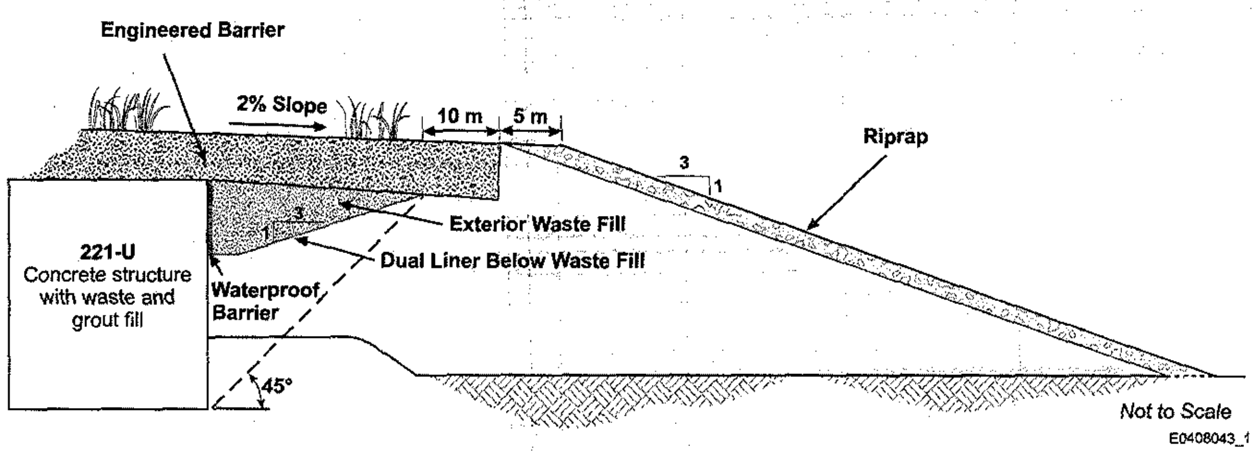


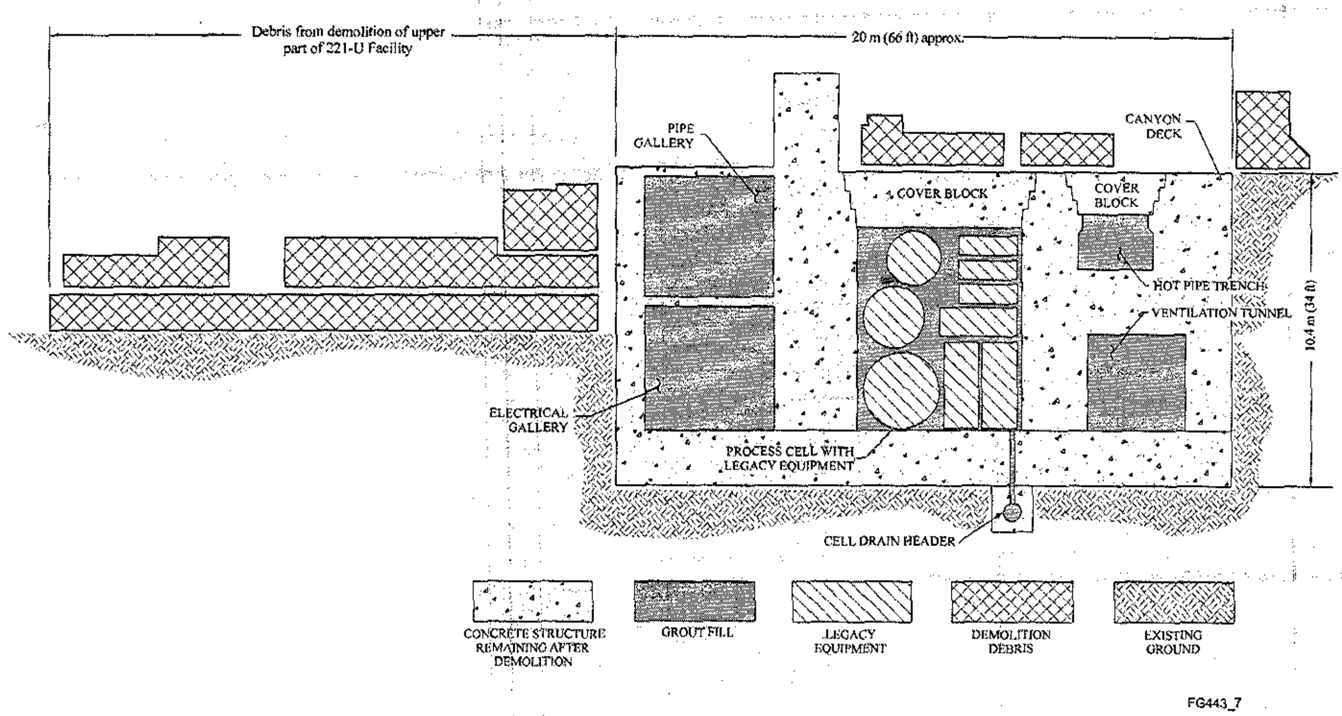
Figure 6. Alternative 4 – Cross Section of the Engineered Barrier and Exterior Waste Fill.



Alternative 6: Close in Place – Partially Demolished Structure

This alternative would require that approximately 3,400 m^3 (4,400 yd^3) of existing contaminated equipment from the canyon deck be size-reduced, disposed to the process cells, and grouted (Figure 7). The upper part of the 221-U Facility would then be demolished to approximately the level of the canyon deck. The concrete debris from building demolition would be placed on the canyon deck and on the ground adjacent to the building. Cementitious grout would be placed around waste, including the pumping of grout into the cell drain header and into tanks containing residual materials, to minimize the potential for void spaces and to reduce the mobility, solubility, and/or toxicity of the grouted waste. Unlike Alternatives 3 and 4, Alternative 6 would not include disposal of imported Hanford Site remediation wastes inside or around the outside of the 221-U Facility. An estimated 9,600 m^3 (12,500 yd^3) of waste generated during building preparation for demolition, as well as soil from remediation of impacted adjacent waste sites and debris from demolition of impacted ancillary facilities would be disposed at the ERDF. These wastes would be sent to ERDF rather than disposed in the canyon due to considerations for optimum handling and scheduling. The use of inert, uncontaminated rubble from other nearby CERCLA demolition activities, such as the ancillary facilities, suitable for fill material in the engineered barrier, will be considered during remedial design.

Figure 7. Alternative 6 – Cross Section of the 221–U Facility Interior and Exterior.



The partially demolished building and concrete debris would be covered with an engineered barrier as in Alternatives 3 and 4; however, the engineered barrier would be smaller in dimension as a result of the decreased height of the structure. Approximately 460,000 m^3 (602,000 yd^3) of borrow materials would be required under this alternative to construct the engineered barrier. The facility, after placement of the barrier, would be approximately 370 m (1,214 ft) in length by 159 m (522 ft) in width by 12 m (39 ft) high.

Post–closure care, institutional controls, and monitoring required as part of this alternative would be similar to Alternatives 3 and 4.

EVALUATION OF REMEDIAL ALTERNATIVES

The following evaluation of remedial alternatives summarizes each alternative in relation to the nine CERCLA criteria. (See box "Explanation of the Nine CERCLA Evaluation Criteria.") A comprehensive analysis of each alternative is contained in the feasibility study.

The first two criteria, overall protection and compliance with potential ARARs, are defined under CERCLA as "threshold criteria." Threshold criteria must be met by an alternative to be eligible for selection. The next five criteria are defined as "primary balancing criteria." These criteria are used to weigh major trade–offs among alternatives. The last two criteria, state and community acceptance, are defined as "modifying criteria." The community acceptance criterion may be considered to the extent that information is available during the feasibility study, but cannot be fully considered until after public comment is received on this Proposed Plan. In the final comparison of alternatives to select a remedy, modifying criteria are of equal importance to the primary balancing criteria.

Overall Protection. The No Action alternative would fail to meet this threshold criterion because contaminated wastes would remain in place above acceptable levels without any measures to contain or monitor contaminants or control exposure pathways. Therefore, the No Action alternative is not discussed further in this evaluation. All remaining alternatives would meet this threshold criterion. Alternative 1 would protect human health and the environment by removing contaminants from the 221–U Facility. Alternative 6 would protect human health and the environment by eliminating or reducing exposure pathways.

EXPLANATION OF THE NINE CERCLA EVALUATION CRITERIA

Threshold Criteria

1. *Overall Protection of Human Health and the Environment,* a threshold criterion, is the primary objective of the remedial action and addresses whether a remedial action provides adequate overall protection of human health and the environment. This criterion must be met for a remedial alternative to be eligible for consideration.
2. *Compliance with Applicable or Relevant and Appropriate Requirements,* a threshold criterion, addresses whether a remedial action will meet all of the applicable or relevant and appropriate requirements and other federal and state environmental statutes, or provides grounds for invoking a waiver of the requirements. This criterion must be met for a remedial alternative to be eligible for consideration.

Primary Balancing Criteria

3. *Long-Term Effectiveness and Permanence,* a primary balancing criterion, refers to the magnitude of residual risk and the ability of a remedial action to maintain long-term, reliable protection of human health and the environment after remedial goals have been met.
4. *Reduction of Toxicity, Mobility, or Volume Through Treatment,* a primary balancing criterion, refers to an evaluation of the anticipated performance of the treatment technologies that may be employed in a remedy. Reduction of toxicity, mobility, and/or volume contributes toward overall protectiveness.
5. *Short-Term Effectiveness,* a primary balancing criterion, refers to evaluation of the speed with which the remedy achieves protection. It also refers to any potential adverse effects on human health and the environment during the construction and implementation phases of a remedial action.
6. *Implementability,* a primary balancing criterion, refers to the technical and administrative feasibility of a remedial action, including the availability of materials and services needed to implement the selected solution.
7. *Cost,* a primary balancing criterion, refers to an evaluation of the capital, operation and maintenance, and monitoring costs for each alternative.

Modifying Criteria

8. *State Acceptance,* a modifying criterion, indicates whether the state concurs with, opposes, or has no comment on the preferred alternative based on review of the feasibility study and the Proposed Plan.
9. *Community Acceptance,* a modifying criterion, assesses the general public response to the Proposed Plan, following a review of the public comments received during the public comment period and open community meetings. The remedial action is selected only after consideration of this criterion.

Remedial Alternatives 3 and 4 consider use of the 221-U Facility as a waste disposal site. However, it has not yet been determined what waste would be disposed of in the 221-U Facility under Alternatives 3 or 4. Additional risk evaluation and waste acceptance criteria would be developed to ensure overall protectiveness for Alternatives 3 or 4, if selected.

Compliance with Applicable or Relevant and Appropriate Requirements. The potential ARARs, such as risk-based cleanup standards, would not be met by Alternative 0. Alternative 1 would provide full compliance with potential ARARs. Alternative 4 would provide full compliance with potential ARARs for disposal of waste external to the 221-U Facility. For disposal of waste currently located within the 221-U Facility, Alternatives 3, 4, and 6 would satisfy RCRA land disposal restrictions by meeting criteria for a treatability variance in accordance with 40 CFR 268.44(h)(2)(i) because it would be technically inappropriate to treat to specified levels or treatment standards. Land disposal restricted waste currently in the 221-U Facility includes radioactive liquid and sludge, primarily contained within steel tanks in the canyon process cells that will be grouted in place to immobilize the waste and minimize void space. Under Alternatives 3, 4, and 6, alternative treatment (encapsulation in grout and ultimate containment within the 221-U Facility reinforced canyon structure) will be provided.

The in-place disposal of waste currently in the 221-U Facility under alternatives 3, 4, and 6 would satisfy RCRA landfill minimum technological requirements for leachate detection by meeting criteria to justify a CERCLA waiver in accordance with 40 CFR 300.430(f)(1)(ii)(C)(3) because, from an engineering standpoint, it is technically impracticable to construct a leachate detection system beneath the canyon building. Waste will be grout-encapsulated within the canyon. An engineered barrier will be constructed to provide contaminant containment. Performance monitoring of the engineered barrier would allow for application of mitigative or preventative action (e.g., increasing barrier thickness) to impede water from reaching the underlying waste. Groundwater monitoring would also be performed to monitor the effectiveness of the remedial action.

The in-place disposal of waste currently in the 221–U Facility under Alternatives 3, 4, and 6 would satisfy RCRA landfill minimum technological requirements for a RCRA double liner and leachate collection system. These requirements would be satisfied by demonstrating that in-place disposal of waste would meet the criteria specified in WAC 173–303–665(2)(j) and that the proposed alternative design and operation would prevent the migration of any dangerous constituents from the 221–U Facility into the groundwater at least as effectively as a traditional liner and leachate collection system. Computer–aided modeling has been performed to demonstrate that, once encapsulated in grout and contained within the reinforced canyon structure, contaminants currently identified in the 221–U Facility would not migrate into the accessible environment including the soils around or under the facility for the duration considered for normal liner performance. Details of this demonstration are provided in the feasibility study.

To meet the TSCA ARARs, the EPA and Ecology propose to use a risk-based determination for the purpose of demonstrating no unreasonable risk of injury to human health or the environment associated with the management of PCB remediation waste in the 221-U Facility, in accordance with 40 CFR 761.61(c), based on the small amount of PCBs identified in the 221-U Facility, and the low volatility of the PCBs.

Long–Term Effectiveness and Permanence. Under Alternative 0, the process of natural attenuation of radiological contaminants (e.g., radioactive decay) could take many thousands of years, and protection could not be ensured. There would be little or no attenuation of nonradiological contaminants, so they would remain a concern indefinitely. All four of the active alternatives would provide a similar degree of long–term effectiveness and permanence. Alternative 1 would transfer contaminants from the 221–U Facility to the ERDF. Containment alternatives 3, 4, and 6 would leave contaminants in place within the 221–U Facility's structure.

The engineered barrier for Alternatives 3 and 4 is significantly higher than those for Alternatives 1 and 6 and would be more susceptible to side slope failure from seismic loading conditions, as well as wind and water erosion. For the containment alternatives it is likely that a one or two layer evapotranspiration barrier, which would be resistant to cracking and self-healing by design, would be used instead of a multilayer barrier.

Alternatively, should engineered barriers fail, the grouted waste form contained in Alternatives 3 and 4 and grouted legacy waste in Alternative 6 would be more protective in the long term than untreated waste. The thick–walled concrete structure of the canyon facility would also contribute to the long–term effectiveness of these alternatives by providing an additional isolation barrier to contaminant transport for a substantial period of time. Long–term use restrictions, monitoring, and engineered barrier maintenance would be similar for both ERDF under Alternative 1 and the engineered barriers for Alternatives 3, 4, and 6.

Remedial Alternatives 3 and 4 consider use of the 221-U Facility as a waste disposal site. However, to date, no viable waste streams have been identified for disposal to the 221–U Facility. Evaluation of post–remediation exposure pathways and exposure risks was not performed for Alternatives 3 and 4 because waste forms to be disposed to the 221–U Facility under these alternatives have not yet been identified. Post–remediation risk evaluation and waste acceptance criteria would be developed based on the waste characteristics and source if Alternative 3 or 4 were selected.

To support Alternatives 3, 4, and 6, it would be necessary to prepare a crosswalk to demonstrate compliance of the cleanup requirements under CERCLA with DOE Order 435.1 requirements for development and management of a radioactive waste disposal facility. Under DOE Order 435.1, the disposal facility must meet performance-based objectives for protection of public health and safety that require releases to the environment to be less than 25 mrem/yr to any member of the public and less than 100 mrem/yr continuous exposure or 500 mrem acute exposure to an inadvertent intruder after institutional controls have terminated.

Post-remediation exposure risks for Alternative 1 meet criteria because the contaminants will be removed to meet the remediation goals. For Alternative 6, the risk evaluation showed that all exposure pathways would be severed. Therefore, for both Alternative 1 and Alternative 6, no excess long-term post-remediation carcinogenic or noncarcinogenic risk is anticipated.

Reduction of Toxicity, Mobility, or Volume Through Treatment. Under Alternatives 3, 4, and 6, the filling of void space with grout would effectively treat by encapsulation both contaminants remaining in the 221-U Facility and wastes received into the facility (Alternatives 3 and 4 only). Grout amendments, such as fly ash or zeolite clays, and the cost-benefit of using a soil-cement grout mixture, would be considered during final design for grouting activities to reduce the potential for leaching of radioactive isotopes and reduce overall grouting costs, respectively. Upon filling the facility, there would be a cementitious matrix formed that would aid in preventing the mobilization of contaminants from the facility. Although the encapsulation of contaminants may not be entirely verifiable in portions of the facility, in general this action would immobilize a large portion of radiological and inorganic wastes. Although treatment is provided to a degree in all active alternatives, the reduction in mobility afforded by grout encapsulation of waste in the three containment alternatives would perform more effectively for this criterion than Alternative 1. Within the containment alternatives, Alternative 6 would perform more effectively than Alternatives 3 and 4 because of the smaller amount of disposed waste in the canyon for Alternative 6. Alternative 3 would perform more effectively than Alternative 4 because exterior waste in Alternative 4 would not be grout encapsulated.

Short-Term Effectiveness. All of the alternatives would be expected to be effective in protecting human health and the environment in the short term. Alternatives 3, 4, and 6 would be more effective in the short term than Alternative 1, due predominantly to a significantly lower risk to workers from radiological exposure and industrial accidents. Alternative 1 is predicted to cause nearly six times more worker dose as a result of exposure to radionuclides than Alternatives 3 and 4, and nearly eight times more than Alternative 6, which would have the lowest worker dose expected of the alternatives. This is because Alternative 1 would require the breaching of a larger number of radioactively contaminated systems and structures that may present hazards to workers through direct exposure as well as inhalation.

Industrial accidents would be more likely for a large-scale decontamination and decommissioning action such as would occur mainly under Alternative 1 and, to a lesser extent, Alternative 6. Waste receipt activities under Alternatives 3 and 4 would occur under controlled circumstances and would not be expected to pose significant worker safety issues. Because Alternative 4 would include placement of waste both inside and outside of the structure, it would perform less effectively in the short term than would Alternative 3 because of the added waste handling activities.

Short-term impacts to vegetation, wildlife, and cultural resources are not considered significant indicators of short-term effectiveness for any alternative at the 221-U Facility because the site and adjacent land area have been previously disturbed. However, Alternatives 1, 3, 4, and 6 could impact natural and cultural resources at borrow sites. The quantity of geologic materials required would be significantly less for Alternative 1; thus, the impacts to these resources would be less. Approximately 86,900 m^3 (113,600 yd^3) of material would be required to backfill and recontour the site for Alternative 1. The total volume of geologic materials would be 1,500,000 m^3 (1,900,000 yd^3) for Alternative 3, 1,400,000 m^3 (1,800,000 yd^3) for Alternative 4, and 460,000 m^3 (602,000 yd^3) for Alternative 6.

Analyses presented in the feasibility study for the 221-U Facility indicate that all alternatives, although their specific activities as described earlier differ to some degree, would take approximately the same amount of time (9 to 10 years) to achieve RAOs.

Implementability. All of the alternatives are considered to be implementable. Alternative 1 and, to a lesser extent, Alternative 6 would involve technical difficulties and safety requirements associated with large-scale radiological decontamination and decommissioning actions. However, these alternatives use standard, proven technologies and are considered implementable. Size reduction, transportation, and disposal of large volumes of radioactively contaminated structures, piping systems, equipment, wastes, and soils would add complexity to Alternative 1 relative to the other alternatives.

Internal waste placement under Alternatives 3 and 4 would be implementable. Technologies for waste receipt and placement using shielded containers and container lift equipment are proven and reliable. External waste placement under Alternative 4 would require that a bottom liner system be placed on a steep slope and attached to a vertical exterior wall. This would complicate the implementation of this alternative. Alternative 6 involves less waste placement (i.e., contaminated legacy equipment on the deck placed into the cells) and, from a material handling perspective, is slightly more implementable than Alternatives 3 and 4, with exterior waste placement under Alternative 4 being the most difficult to implement.

Construction of an engineered barrier for the containment alternatives would require innovative engineering design applications. Alternatives 3 and 4 have the greatest inherent engineered barrier design uncertainty due to height. Inherent uncertainties include instability during certain seismic conditions, as well as possible sideslope instability and susceptibility to erosion. The engineered barrier for Alternative 6 faces similar performance issues. However, because the barrier for Alternative 6 would not be as high as the barriers for Alternatives 3 and 4, these performance issues would be less pronounced. Alternative 4 would be the most complex engineered barrier to construct because of technical issues in the construction of the external liner installation, the exterior wall of the 221-U Facility, and the steeply lined area for external waste fill. In addition, the steep slope for the external fill area in Alternatives 3 and 4 would need to be built in stages to accommodate the need for equal loading of outside and inside wall of the 221-U Facility during waste placement. Geotechnical specialists would be required for design of the engineered barrier.

Because of the technical difficulties that may result in the design and construction of the engineered barrier, Alternatives 3 and 4 are considered slightly less implementable than Alternatives 1 and 6, with Alternative 4 being the most difficult to implement.

Costs. Table 4 summarizes the capital, operation and maintenance, and total present-worth costs for each alternative. The present-worth costs for Alternatives 6 and 1 are $67 million and $84 million, respectively, making these the least costly alternatives. The present worth costs for Alternatives 3 and 4 are $111 million and $113 million, respectively.

At this time, the remedy for the ancillary facilities immediately adjacent to the 221-U Building is unknown. It is assumed that the adjacent ancillary facilities will be removed before implementation of the selected CDI alternative. The removal action will be evaluated in the future by one or more engineering evaluation/cost analysis documents. However, for planning purposes, the evaluation in the feasibility study assumes that costs associated with the demolition and disposal of these facilities will be incurred by the 221-U Facility Decontamination and Demolition Project. Decontamination of these facilities is assumed to have been completed under another project before implementation of the preferred alternative; therefore, decontamination costs are not included in cost estimates for any of the alternatives.

SUMMARY OF THE PREFERRED ALTERNATIVE

Based on the available information and the analysis of the CERCLA evaluation criteria, the Tri-Parties are proposing Alternative 6, Close in Place – Partially Demolished Structure, as the preferred alternative for the 221-U Facility. Alternative 6 meets the threshold criteria and provides the best balance of trade-offs among the other alternatives with respect to the threshold and primary balancing criteria. The Tri-Parties expect the preferred alternative to satisfy the following statutory requirements of CERCLA §121(b):

- Be protective of human health and the environment,
- Comply with potential ARARs, except that a CERCLA waiver would be obtained in accordance with 40 CFR 300.430(f)(1)(ii)(C)(3) from the RCRA landfill minimum technological requirement for leachate detection,
- Be cost-effective,
- Use permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable,
- Satisfy the preference for treatment as a principal element.

All of the alternatives other than Alternative 0 meet the threshold criteria for protection of human health and the environment and compliance with potential ARARs (or meet criteria for ARAR waiver), thus satisfying threshold CERCLA criteria (1) for *Overall Protection* and (2) *Compliance with ARARs* (See box "Explanation of the Nine CERCLA Evaluation Criteria" on p. 18 for criteria.) Alternative 6 is also the least costly alternative, is similarly or more effective than the other alternatives for the long term and short term, and is considered implementable, thus satisfying the statutory requirement to be cost-effective (Criterion 3, Long-term effectiveness and permanence). Alternative 6 provides a similar degree of permanence compared to the other alternatives because all alternatives involve hazardous substance disposal on the Hanford Site.

Table 4. 221-U Facility Remediation Total Project Cost Summary.

Project Phase	Dollar Amounts			
	Alternative 1	**Alternative 3**	**Alternative 4**	**Alternative 6**
	Capital Cost Summary			
Prepare the existing complex				
Assessment activities	700,000	700,000	700,000	700,000
Design activities	7,900,000	8,800,000	9,000,000	4,500,000
Removal of sludge and liquids from equipment	1,300,000	1,300,000	1,300,000	1,300,000
Establish infrastructure	1,600,000	2,000,000	2,200,000	1,600,000
Modify 221-U Facility	15,400,000	16,900,000	16,900,000	16,500,000
Modify external area				
Disposition of external legacy structures	5,300,000	21,800,000	21,800,000	20,900,000
Disposition of waste sites within footprint	2,000,000	0	0	0
Operate existing complex				
Building demolition, removal, and disposal	59,000,000	1,300,000	1,300,000	10,700,000
Fill galleries with waste and grout	0	8,400,000	8,400,000	1,400,000
Fill operating deck area with waste and grout	0	16,400,000	16,400,000	0
Construct engineered clean fill	0	30,200,000	28,800,000	7,400,000
Construct external leachate collection system	0	0	1,600,000	0
Place external contaminated soil fill	0	0	1,900,000	0
Close complex				
Backfill 221-U excavation void	1,300,000	0	0	0
Construct engineered barrier	0	4,700,000	4,700,000	4,100,000
Construct erosion protection on sideslopes	0	7,800,000	7,800,000	3,100,000
Revegetate	30,000	50,000	50,000	50,000
Closeout activities	200,000	200,000	200,000	200,000
Demobilization	50,000	60,000	60,000	50,000
Establish groundwater or vadose zone monitoring	0	300,000	300,000	300,000
Total capital costs (Undiscounted)	**94,800,000**	**120,900,000**	**123,400,000**	**72,800,000**
	O&M Cost Summary			
Monitoring and inspections (Total)	500,000	49,300,000	49,300,000	49,000,000
Engineered barrier replacement (year 500 only)	500,000	4,700,000	4,700,000	4,100,000
Total O&M Cost (Undiscounted)	**1,000,000**	**54,000,000**	**54,000,000**	**53,100,000**
	Overall Cost Summary			
Project Total Costs (Undiscounted)	**95,800,000**	**174,900,000**	**177,400,000**	**125,900,000**
Net Present Worth Totals	**84,400,000**	**111,200,000**	**113,100,000**	**67,400,000**

NOTE: All cost estimates have an accuracy of -30% to +50%. Present-worth costs are based on a 3.2% real discount rate (OMB Circular No. A-94, Appendix C) and a 1,000-year period of performance. Total undiscounted costs are 2001 dollars for a 1,000-year period of analysis. All costs have been rounded. Under "Engineered barrier replacement" for Alternative 1, $500K is included for the 221-U share of the ERDF barrier construction and replacement at year 500.

O&M = Operations and Maintenance

The use of grout to fill void spaces will act as a treatment to encapsulate waste and reduce toxicity characteristics. Grouting will serve to help satisfy CERCLA evaluation criteria (4) and (5) (*Reduction of toxicity and mobility through treatment* and *Short-term effectiveness*, respectively) for Alternatives 3, 4, and 6 by immobilizing contaminants in the building's structure and contaminated equipment. Although treatment is provided to a degree in all four active alternatives, the reduction in mobility afforded by grout encapsulation of waste in the three containment alternatives would perform more effectively for these criteria than Alternative 1. Within the containment alternatives, Alternative 6 would perform more effectively than Alternatives 3 and 4 because of the smaller amount of disposed waste in the canyon for Alternative 6.

The State of Washington supports the preferred alternative. Community acceptance will be considered after all public comments on this Proposed Plan have been received.

Changes to the preferred alternative presented in this Proposed Plan or changes to another alternative may be made if public comments and/or additional data indicate that such a change would result in a more appropriate cleanup solution. The decision regarding the selected remedies for the 221–U Facility will be documented in a final ROD after review and consideration of all significant comments on this Proposed Plan.

Under Alternative 6, the Tri–Parties do not anticipate bringing additional remediation wastes to the 221–U Facility for disposal. However, subsequent to a ROD for Alternative 6, if a viable waste stream is identified for disposal to the facility, then the public will be notified, and the ROD will be modified (e.g., through ROD amendment, Explanation of Significant Differences), as appropriate. In the event that a waste stream is identified, additional risk evaluations will be conducted and waste acceptance criteria will be developed.

NATIONAL ENVIRONMENTAL POLICY ACT

DOE 1994, *Secretarial Policy on the National Environmental Policy Act* and DOE Order 451.1B, *National Environmental Policy Act Compliance Program*, require that CERCLA documents incorporate NEPA values, such as analysis of cumulative, offsite, ecological, and socioeconomic impacts, to the extent practicable, in lieu of preparing separate NEPA documentation for CERCLA activities.

The NEPA process is intended to help Federal agencies:

- Make decisions that are based on understanding of environmental consequences, and
- Take actions that protect, restore, and enhance the environment.

In the 1996 *Agreement in Principle*, the Tri-Parties concurred that, while following the CERCLA process for disposition of the five canyon facilities at Hanford, separate NEPA documentation would not be required because NEPA values are incorporated into the CERCLA documents.

The NEPA values that have been considered for the 221–U Facility support the CERCLA decision making process and are summarized in the following text. The No Action alternative has no impact on NEPA values and is not included in the discussion.

Transportation Impacts. None of the proposed remedial alternatives would be expected to create any long–term transportation impacts. If adverse impacts to transportation were to be detected, remedial activities would be modified or halted until the impact is mitigated.

Air Quality. Potential air quality impacts are associated with all of the alternatives. These impacts have not been quantified but in the near term would be expected to be minor. For Alternatives 1, 3, 4, and 6, impacts would be mitigated through appropriate engineering controls to be identified during final design and in the remedial action work plan.

Natural, Cultural, and Historical Resources. Some short–term adverse impacts to natural or cultural resources could occur during implementation of Alternatives 1, 3, 4, and 6. The area immediately around the 221–U Facility is heavily developed with little wildlife or useable habitat, so few impacts to existing biological or cultural resources are anticipated at the facility. In terms of historical resources, the 221-U Facility was determined to be a contributing property within the Hanford Site Manhattan Project and Cold War Era Historic District, but was not selected for mitigation.

Potential impacts to biological or cultural resources would be a greater concern at borrow sites because they are located in otherwise undisturbed areas. Borrow material would be obtained on or near the Central Plateau, an area that contains important big sagebrush communities. In any alternative, it would be critical to avoid disturbing sagebrush communities and any other high quality habitat. The use of inert, uncontaminated rubble from other nearby CERCLA demolition activities as barrier fill could decrease the amount of borrow materials needed and the area of affected habitat. A common borrow area for barrier materials needed for the Central Plateau cleanup is the subject of ongoing studies and separate NEPA evaluation. Documentation for the operation and closure of this borrow area will be prepared to define impacts and specify controls to minimize adverse effects.

Alternative 1 would require the least amount of borrow material and, therefore, would have the fewest potential impacts at borrow sites. Alternatives 3 and 4 would require 17 times more borrow material than Alternative 1 and would have the greatest potential impacts at borrow sites. Alternative 6 would require about five times more borrow material than Alternative 1. Alternative 1 presents the greatest potential for adverse ecological impacts at the ERDF, which is located in an area of high-quality shrub-steppe habitat. Alternative 1 would require about a 12% expansion of an ERDF cell for waste disposal.

Noise, Visual, and Aesthetic Effects. Alternatives 1, 3, 4, and 6 would increase noise levels, but the impacts would be of short-term duration during remedial actions and would not affect offsite noise levels. Alternative 1 would have a positive impact on visual and aesthetic effects. Conversely, Alternatives 3 and 4 and, to a lesser extent, Alternative 6 could have a negative long-term visual and aesthetic impact due to the visibility of the disposal facility from a distance. Under Alternatives 3 and 4, the facility would be approximately 24 m (80 ft) in height, and under Alternative 6, would be approximately 12 m (39 ft) in height.

Socioeconomic Impacts. The 221-U Facility itself is not a factor in the socioeconomics of the region. The number of workers involved in remedial actions under any of the alternatives would be small; therefore, impacts would be negligible.

Environmental Justice. Offsite impacts to any of the local communities would be minimal for all of the alternatives, so environmental justice issues (i.e., high and disproportionate adverse health and socioeconomic impacts on minority or low-income populations) would not be a concern.

Irreversible and Irretrievable Commitment of Resources. Depending on the alternative selected, remedial action at the 221-U Facility could require an irreversible or irretrievable commitment of resources, particularly land use and geologic materials.

All of the alternatives would result in land-use loss to some extent. Alternatives 3, 4, and 6 would have the greatest impact because they would leave all or part of the 221-U Facility in place. This would make the site unlikely to be usable for other purposes, including industrial uses, for the foreseeable future. Alternative 1 would also limit site use, but to a lesser extent because contamination could remain below industrial cleanup standards but above unrestricted use standards to a depth of at least 4.6 m (15 ft). Contamination above industrial cleanup standards might remain at greater depths. Alternative 1 would also result in land-use loss for ERDF disposal, because the ERDF would need to be expanded by about 12% of one cell to accommodate 221-U Facility waste, precluding other uses of this portion of the ERDF for the foreseeable future.

Alternatives 1, 3, 4, and 6 also would require an irretrievable and irreversible commitment of resources in the form of geologic materials. The quantity required would be significantly less for Alternative 1. This material would be obtained from onsite borrow pits (i.e., borrow sources located within the Hanford Site boundaries). In addition, there would be an estimated increase of approximately 15,000 m^3 (20,000 yd^3) in the amount of material required for the engineered barrier at ERDF for Alternative 1. Alternatives 1, 3, 4, and 6 also would require an irretrievable and irreversible commitment of resources in the form of petroleum products (e.g., diesel fuel, and gasoline).

Cumulative Effects. The proposed remedial action alternatives could have impacts when considered together with impacts from past and foreseeable future actions at and near the Hanford Site. Authorized current and future activities in the 200 Areas that might be ongoing during remedial action include soil and groundwater remediation; operation and closure of underground waste tanks; construction and operation of tank waste vitrification facilities; storage of spent nuclear fuel; and surveillance, maintenance, and decontamination and decommissioning of reprocessing facilities and excess ancillary facilities. Other activities on the Hanford Site include removal of spent nuclear fuel from the K Basins, and operation of the Energy Northwest commercial reactor. Activities near the Hanford Site include a privately owned radioactive and mixed waste treatment facility, a commercial fuel manufacturer, and a titanium reprocessing plant.

There is some potential for impacts to natural resources at onsite borrow sites, although impacts can be minimized by appropriate planning. A DOE NEPA environmental assessment that evaluated impacts to borrow sites from Hanford Site projects including remediation did not identify significant impacts associated with continued use of onsite borrow pits.

Under Alternatives 3, 4, and 6, the 221–U Facility would become a permanent above-grade structure in the 200 West Area. With Alternatives 3 and 4, the structure would be about 24.4 m (80 ft) high and visible from a distance. Depending on other remediation activities in the 200 Areas (particularly the disposition of other canyon facilities), the facility could either be one of several such structures or could become a singular man-made element in an otherwise scenic landscape.

SUPPORTING DOCUMENTS

The public is encouraged to read the following documents to gain a better understanding of the 221-U Facility:

Final Feasibility Study for the Canyon Disposition Initiative (221–U Facility), DOE/RL–2001–11, Rev. 1, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

Agreement In Principle (AIP) Including Path Forward for Canyon Disposition Initiative (CDI), DOE–RL, 1996, letter no. 038471, dated October 21, 1996, to D. R. Sherwood, U.S. Environmental Protection Agency, and M. A. Wilson, Washington State Department of Ecology, from L. K. Bauer, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

Final Data Report for the 221-U Facility Characterization, BHI-01565, Rev. 0, Bechtel Hanford, Inc., Richland, Washington

Hanford Comprehensive Land–Use Plan Environmental Impact Statement, DOE/EIS–0222–F, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

Hanford Federal Facility Agreement and Consent Order, Fourth Amendment, Washington State Department of Ecology, U.S. Environmental Protection Agency, and U.S. Department of Energy, Olympia, Washington.

Phase I Feasibility Study for the Canyon Disposition Initiative (221–U Facility), DOE/RL–97–11, Rev. 1, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

Focused Feasibility Study for the U Plant Closure Area Waste Sites, DOE/RL–2003–23, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

Drummond, M. E., 1992, *The Future for Hanford: Uses and Cleanup, the Final Report of the Hanford Future Site Uses Working Group*, Richland, Washington.

ADMINISTRATIVE RECORD

The Administrative Record can be viewed at the following location:

Lockheed Martin Services, Inc.
Administrative Record
2440 Stevens Center Place, Room 1101
Richland, Washington 99354
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509/372–7443
ATTN: Janice Pathree
email: reading_room@pnl.gov

GLOSSARY AND TERMS

The first usage of technical terms and other specialized text in this Proposed Plan is shown in bold in the text of this document, and the terms are defined below.

Administrative Record – The files containing all the documents used to select a response action at a CERCLA remedial action site. Locations where the Administrative Record for the Hanford Site is maintained are provided near the end of this document.

Applicable or relevant and appropriate requirements (ARARs) – Standards, criteria, or limitations under federal or more stringent state environmental laws, including RCRA, that may be required during a Superfund remedial action, unless site-specific waivers are obtained.

Canyon buildings – Hanford Site chemical separations plants, called canyon buildings or canyon facilities, were constructed from 1944 through 1945 by the E. I. DuPont de Nemours and Company for the U.S. Army Corps of Engineers in support of World War II plutonium production. These facilities were termed "canyon" buildings because of their monolithic size and the canyon-like appearance of their interiors.

Comprehensive Environmental Response, Compensation and Liability Act of 1980 **(CERCLA)** – A Federal law that establishes a program that addresses liability, enforcement, and cleanup of federal and commercial facilities and allows government entities to evaluate damages to natural resources. CERCLA is also known as the "Superfund."

Containment alternatives – Remedial alternatives that rely on placement of an engineered barrier over a waste site to limit infiltration of precipitation, thereby providing protection of groundwater by limiting mobilization of contaminants in the vadose soils. Containment may also be implemented to prevent intrusion by humans and/or biota. The containment remedial alternatives include grouting to encapsulate waste and fill voids, further limiting contaminant mobility and the potential for intrusion.

Contaminants of concern (COC) – Any contaminant that is expected to be present at the site based upon past and current land uses and associated releases based upon reasonable inquiry, and which presents a threat to human health and the environment.

Engineered barrier – An engineered surface covering, or cap, constructed over a contaminated site as a cleanup remedy that severely limits or prevents the vertical movement of water through the underlying waste and subsequent downward leaching of contaminants to the vadose zone and groundwater. Engineered barriers also may function as physical barriers to prevent intrusion by human and ecological receptors, limit wind and water erosion, and shield radiation.

Environmental Restoration Disposal Facility (ERDF) – The Hanford Site's disposal facility for most CERCLA waste and contaminated environmental media (contingent upon meeting the ERDF waste acceptance criteria) generated under a CERCLA remedial or removal action. The ERDF currently receives wastes from ongoing remedial actions in the 300 Area and other Hanford NPL sites.

Evapotranspiration – The total water loss from the soil, including that by direct evaporation and that by transpiration from the surfaces of plants

Feasibility study – A CERCLA study undertaken by the lead agency to develop and evaluate options for remedial action. The feasibility study emphasizes data analysis and is generally performed concurrently and in an interactive fashion with the remedial investigation, using data gathered during the remedial investigation. The remedial investigation data are used to define the objectives of the response action, to develop remedial action alternatives, and to undertake an initial screening and detailed analysis of the alternatives. The term also refers to a report that describes the results of the study.

Hazardous substances – Any material that poses a threat to human health and/or the environment as defined in Section 101(14) of CERCLA.

Inadvertent intruder scenario – An exposure scenario in which the receptor (such as a construction trench worker or driller) has trenched or drilled into the contaminated soil and is, therefore, exposed. The scenario assumes that, after 150 years of institutional controls, the intruder could unknowingly obtain access to the contaminated area and bring contaminated material to the surface where residents could be exposed. Exposure pathways evaluated include direct exposure to radiation, ingestion of soil and garden produce, and inhalation of resuspended dust.

Industrial scenario – "Industrial exclusive" is a land–use designation under the land-use EIS (DOE/EIS–0222–F) that applies to the 200 Areas core zone. Under this land–use designation, waste management activities would continue. This land use assumes an industrial worker scenario, in which the receptor works on–site on a full–time basis (that is, the worker spends 2,000 hours per year on–site over the duration of his entire career). It assumes the land use at the 200 Area exposure pathways evaluated include direct exposure to radiation, incidental ingestion of soil, and inhalation of resuspended dust and volatile constituents. Exposure to groundwater is not considered.

Institutional controls – Nonengineered instruments, such as administrative and/or legal controls, that minimize the potential for exposure to contamination by limiting land or resource use. The State of Washington also considers physical controls, such as fencing and signs, to be institutional controls as well.

***National Environmental Policy Act of 1969* (NEPA)** – A Federal law that establishes a program to promote efforts to prevent or eliminate damage to the environment. Values for this act encompass a range of environmental concerns and cumulative impacts.

National Priorities List (NPL) – A list compiled by the EPA of uncontrolled hazardous substance releases in the United States that are priorities for long–term remedial evaluation and response.

Operable unit – As applied to the Hanford Site, an OU is a group of land disposal sites or groundwater plumes placed together for the purposes of investigation and subsequent cleanup actions.

Potential Evapotranspiration (PET) - PET is the evapotranspiration that would occur under given climatic conditions if the soil moisture supply were unlimited in the soil for the collective loss of water by transpiration and evaporation. Factors that influence the PET include such things as local climate characteristics (for example net solar radiation, heat flux in the ground, wind speed, vapor pressure, and the psychometric constant) and local plant and soil characteristics.

Preliminary remediation goals (PRGs) – Initial cleanup levels that are developed during the CERCLA decision–making process. PRGs may be refined in the ROD to become final cleanup levels (i.e., remedial action goals).

Proposed Plan – A document that summarizes the analysis of different cleanup options and explains which option (called the "preferred alternative") is being recommended for public review and comment.

Record of Decision (ROD) – The formal document in which a regulatory agency sets forth the selected remedial measure and the reasons for its selection.

Remedial action – A cleanup remedy that is implemented at a site to address one or more of the contamination problems.

Remedial action objectives (RAOs) – General descriptions of what the remedial action will accomplish (e.g., restoration of a waste site). RAOs are media–specific or operable unit–specific objectives for protecting human health and the environment. They are developed considering the land use, contaminants of potential concern, potential ARARs, and exposure pathways via a conceptual model. They also specify remediation goals so that an appropriate range of remedial options can be developed for evaluation.

RCRA double liner and leachate collection system – A RCRA double liner and leachate collection system for a landfill meets the requirements of WAC 173–303–665(2)(h) and Section 3004(o) and 3015 of the Hazardous and

Solid Waste Amendments of RCRA. It consists of a top liner and a bottom liner with two leachate collection and removal systems, one placed between the liners and one placed under the bottom liner.

Tri–Party Agreement – An agreement and consent order between the Department of Energy, the U. S. Environmental Protection Agency and the Washington State Department of Ecology that details the process to be used to address CERCLA, RCRA, and state requirements for cleaning up the Hanford Site.

Vadose Zone – The unsaturated soil layer in the zone between the ground surface and the permanent, continuous water table.

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